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Stability Analysis of Infinite Slopes in Prism Formulas

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List of 23 Stability Analysis of Infinite Slopes in Prism Formulas

Stability Analysis of Infinite Slopes in Prism

1) Angle of Inclination given Horizontal Length of Prism

Open Calculator

fx $$I = a\cos\left(\frac{L}{b}\right)$$

ex $$78.46304^\circ = a\cos\left(\frac{2\text{m}}{10\text{m}}\right)$$

2) Angle of Inclination given Vertical Stress on Surface of Prism

Open Calculator

fx $$I = a\cos\left(\frac{\sigma_{vertical}}{z\cdot\gamma}\right)$$

ex $$89.98939^\circ = a\cos\left(\frac{10\text{Pa}}{3\text{m}\cdot 18\text{kN/m}^3}\right)$$

3) Angle of Inclination given Volume per Unit Length of Prism

Open Calculator

fx $$I = a\cos\left(\frac{V_l}{z\cdot b}\right)$$

ex $$80.40593^\circ = a\cos\left(\frac{5\text{m}^2}{3\text{m}\cdot 10\text{m}}\right)$$

4) Angle of Inclination given Weight of Soil Prism

Open Calculator

fx $$I = a\cos\left(\frac{W}{\gamma\cdot z\cdot b}\right)$$

ex $$79.32807^\circ = a\cos\left(\frac{100\text{kg}}{18\text{kN/m}^3\cdot 3\text{m}\cdot 10\text{m}}\right)$$

5) Cohesion given Factor of Safety for Cohesive Soil

Open Calculator

fx
$$c = \left(f_s - \left(\frac{\tan\left(\frac{\varphi\cdot\pi}{180}\right)}{\tan\left(\frac{I\cdot\pi}{180}\right)}\right)\right)\cdot\left(\gamma\cdot z\cdot\cos\left(\frac{I\cdot\pi}{180}\right)\cdot\sin\left(\frac{I\cdot\pi}{180}\right)\right)$$

ex
$$2.926924\text{kPa} = \left(2.8 - \left(\frac{\tan\left(\frac{46^\circ\cdot\pi}{180}\right)}{\tan\left(\frac{80^\circ\cdot\pi}{180}\right)}\right)\right)\cdot\left(18\text{kN/m}^3\cdot 3\text{m}\cdot\cos\left(\frac{80^\circ\cdot\pi}{180}\right)\cdot\sin\left(\frac{80^\circ\cdot\pi}{180}\right)\right)$$

6) Depth of Prism given Factor of Safety for Cohesive Soil

Open Calculator

fx
$$z = \frac{c_u}{\left(f_s - \left(\frac{\tan((\Phi_i))}{\tan((I))}\right)\right)\cdot\gamma\cdot\cos((I))\cdot\sin((I))}$$

ex
$$2.336534\text{m} = \frac{10\text{Pa}}{\left(2.8 - \left(\frac{\tan((82.87^\circ))}{\tan((80^\circ))}\right)\right)\cdot 18\text{kN/m}^3\cdot\cos((80^\circ))\cdot\sin((80^\circ))}$$

7) Depth of Prism given Vertical Stress on Surface of Prism

Open Calculator

fx
$$z = \frac{\sigma_{vertical}}{\gamma\cdot\cos((I))}$$

ex
$$3.199317\text{m} = \frac{10\text{Pa}}{18\text{kN/m}^3\cdot\cos((80^\circ))}$$

8) Depth of Prism given Volume per Unit Length of Prism

Open Calculator

fx
$$z = \frac{V_l}{b\cdot\cos((I))}$$

ex
$$2.879385\text{m} = \frac{5\text{m}^2}{10\text{m}\cdot\cos((80^\circ))}$$

9) Depth of Prism given Weight of Soil Prism

Open Calculator

$$z = \frac{W}{\gamma \cdot b \cdot \cos((I))}$$

$$3.199317\text{m} = \frac{100\text{kg}}{18\text{kN/m}^3 \cdot 10\text{m} \cdot \cos((80^\circ))}$$

10) Factor of Safety for Cohesive Soil given Cohesion

Open Calculator

$$f_s = \left(\frac{c_u}{\gamma \cdot z \cdot \cos((I)) \cdot \sin((I))}\right) + \left(\frac{\tan((\Phi_i))}{\tan((I))}\right)$$

$$1.410703 = \left(\frac{10\text{Pa}}{18\text{kN/m}^3 \cdot 3\text{m} \cdot \cos((80^\circ)) \cdot \sin((80^\circ))}\right) + \left(\frac{\tan((82.87^\circ))}{\tan((80^\circ))}\right)$$

11) Horizontal Length of Prism

Open Calculator

$$L = b \cdot \cos((I))$$

$$1.736482\text{m} = 10\text{m} \cdot \cos((80^\circ))$$

12) Inclined Length along Slope given Horizontal Length of Prism

Open Calculator

$$b = \frac{L}{\cos((I))}$$

$$11.51754\text{m} = \frac{2\text{m}}{\cos((80^\circ))}$$

13) Inclined Length along Slope given Vertical Stress on Surface of Prism

Open Calculator

$$b = \frac{W}{\sigma_z} \cdot 5$$

$$50\text{m} = \frac{100\text{kg}}{10\text{MPa}} \cdot 5$$

14) Inclined Length along Slope given Volume Per Unit Length of Prism

Open Calculator

$$\text{fx}\quad b = \frac{V_l}{z \cdot \cos((I))}$$

$$\text{ex}\quad 9.597951\text{m} = \frac{5\text{m}^2}{3\text{m} \cdot \cos((80^\circ))}$$

15) Inclined Length along Slope given Weight of Soil Prism

Open Calculator

$$\text{fx}\quad b = \frac{W}{\gamma \cdot z \cdot \cos((I))}$$

$$\text{ex}\quad 10.66439\text{m} = \frac{100\text{kg}}{18\text{kN/m}^3 \cdot 3\text{m} \cdot \cos((80^\circ))}$$

16) Unit Weight of Soil given Factor of Safety for Cohesive Soil

Open Calculator

$$\text{fx}\quad \gamma = \frac{c}{\left(f_s - \left(\frac{\tan\left(\frac{\varphi \cdot \pi}{180}\right)}{\tan\left(\frac{I \cdot \pi}{180}\right)}\right)\right) \cdot z \cdot \cos\left(\frac{I \cdot \pi}{180}\right) \cdot \sin\left(\frac{I \cdot \pi}{180}\right)}$$

$$\text{ex}\quad 18.5109\text{kN/m}^3 = \frac{3.01\text{kPa}}{\left(2.8 - \left(\frac{\tan\left(\frac{46^\circ \cdot \pi}{180}\right)}{\tan\left(\frac{80^\circ \cdot \pi}{180}\right)}\right)\right) \cdot 3\text{m} \cdot \cos\left(\frac{80^\circ \cdot \pi}{180}\right) \cdot \sin\left(\frac{80^\circ \cdot \pi}{180}\right)}$$

17) Unit Weight of Soil given Vertical Stress on Surface of Prism

Open Calculator

$$\text{fx}\quad \gamma = \frac{\sigma_{\text{vertical}}}{z \cdot \cos((I))}$$

$$\text{ex}\quad 19.1959\text{kN/m}^3 = \frac{10\text{Pa}}{3\text{m} \cdot \cos((80^\circ))}$$

18) Unit Weight of Soil given Weight of Soil Prism

Open Calculator

$$\gamma = \frac{W}{z \cdot b \cdot \cos((I))}$$

$$19.1959\text{kN/m}^3 = \frac{100\text{kg}}{3\text{m} \cdot 10\text{m} \cdot \cos((80^\circ))}$$

19) Vertical Stress on Surface of Prism

Open Calculator

$$\sigma_z = \frac{W}{b}$$

$$1\text{E}\hat{}\text{-}5\text{MPa} = \frac{100\text{kg}}{10\text{m}}$$

20) Vertical Stress on Surface of Prism given Unit Weight of Soil

Open Calculator

$$\sigma_z = (z \cdot \gamma \cdot \cos((I)))$$

$$9.377002\text{MPa} = (3\text{m} \cdot 18\text{kN/m}^3 \cdot \cos((80^\circ)))$$

21) Volume Per Unit Length of Prism

Open Calculator

$$V_l = (z \cdot b \cdot \cos((I)))$$

$$5.209445\text{m}^2 = (3\text{m} \cdot 10\text{m} \cdot \cos((80^\circ)))$$

22) Weight of Soil Prism given Vertical Stress on Surface of Prism

Open Calculator

$$W = \sigma_{\text{vertical}} \cdot b$$

$$100\text{kg} = 10\text{Pa} \cdot 10\text{m}$$

23) Weight of Soil Prism in Stability Analysis

Open Calculator

$$W = (\gamma \cdot z \cdot b \cdot \cos((I)))$$

$$93.77002\text{kg} = (18\text{kN/m}^3 \cdot 3\text{m} \cdot 10\text{m} \cdot \cos((80^\circ)))$$

Variables Used

- **b** Inclined Length *(Meter)*
- **c** Cohesion of Soil *(Kilopascal)*
- c_u Unit Cohesion *(Pascal)*
- f_s Factor of Safety
- **I** Angle of Inclination *(Degree)*
- **L** Horizontal Length of Prism *(Meter)*
- V_l Volume per unit length of prism *(Square Meter)*
- **W** Weight of Prism *(Kilogram)*
- **z** Depth of Prism *(Meter)*
- **γ** Unit Weight of Soil *(Kilonewton per Cubic Meter)*
- $\sigma_{vertical}$ Vertical Stress at a Point in Pascal *(Pascal)*
- σ_z Vertical Stress at a Point *(Megapascal)*
- **φ** Angle of Internal Friction *(Degree)*
- Φ_i Angle of Internal Friction of Soil *(Degree)*

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Function: **acos**, acos(Number)
  The inverse cosine function, is the inverse function of the cosine function. It is the function that takes a ratio as an input and returns the angle whose cosine is equal to that ratio.
- Function: **cos**, cos(Angle)
  Cosine of an angle is the ratio of the side adjacent to the angle to the hypotenuse of the triangle.
- Function: **sin**, sin(Angle)
  Sine is a trigonometric function that describes the ratio of the length of the opposite side of a right triangle to the length of the hypotenuse.
- Function: **tan**, tan(Angle)
  The tangent of an angle is a trigonometric ratio of the length of the side opposite an angle to the length of the side adjacent to an angle in a right triangle.
- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Weight** in Kilogram (kg)
  Weight Unit Conversion
- Measurement: **Area** in Square Meter (m²)
  Area Unit Conversion
- Measurement: **Pressure** in Pascal (Pa), Kilopascal (kPa), Megapascal (MPa)
  Pressure Unit Conversion
- Measurement: **Angle** in Degree (°)
  Angle Unit Conversion
- Measurement: **Specific Weight** in Kilonewton per Cubic Meter (kN/m³)
  Specific Weight Unit Conversion

Check other formula lists

- Bearing Capacity for Strip Footing for C-Φ Soils Formulas
- Bearing Capacity of Cohesive Soil Formulas
- Bearing Capacity of Non-cohesive Soil Formulas
- Bearing Capacity of Soils Formulas
- Bearing Capacity of Soils: Meyerhof's Analysis Formulas
- Foundation Stability Analysis Formulas
- Atterberg Limits Formulas
- Bearing Capacity of Soil: Terzaghi's Analysis Formulas
- Compaction of Soil Formulas
- Earth Moving Formulas
- Lateral Pressure for Cohesive and Non Cohesive Soil Formulas
- Minimum Depth of Foundation by Rankine's Analysis Formulas
- Pile Foundations Formulas
- Scraper Production Formulas
- Seepage Analysis Formulas
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- Soil Origin and Its Properties Formulas
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- Vibration Control in Blasting Formulas
- Void Ratio of Soil Sample Formulas
- Water Content of Soil and Related Formulas

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